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OZONE AND NITROGEN DIOXIDE GROUND BASED MONITORING
BY ZENITH SKY VISIBLE SPECTROMETRY IN ARTIC AND
ANTARCTIC

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Unattended diode array spectrometers have been designed for ground based stratospheric trace species monitoring by zenith sky visible spectrometry. Measurements are performed with a 1.0 nm resolution between 290 nm and 590 nm in order to allow simultaneous evaluations of column densities of ozone, nitrogen dioxide. Field tests have shown that the species can be monitored with a precision of ± 2 Dobson for the first and $\pm 2.10^{15}$ mol./cm² for the second, although the absolute accuracy of the method is limited by the error of the estimation of the atmospheric optical path of the scattered light. Two identical instruments have been set-up in January 1988, one in Antarctica at Dumont d'Urville (66 S, 140 E) which will be operated all along the year and an other one in the Arctic at Esrange at Kiruna (68 N; 22 E) which will stay up to the final warming of spring 1988. The data are processed in real time at both stations. O₃ and NO₂ columns are transmitted together with surface and stratospheric temperature and winds. They are also recorded for further treatment and search for OCIO and BrO.

Only one month of data from Antarctica is available at the moment (figure 1). Obtained during polar summer they cannot show more than stable columns of O₃ and NO₂ and for the last species, the build up of its diurnal variation.

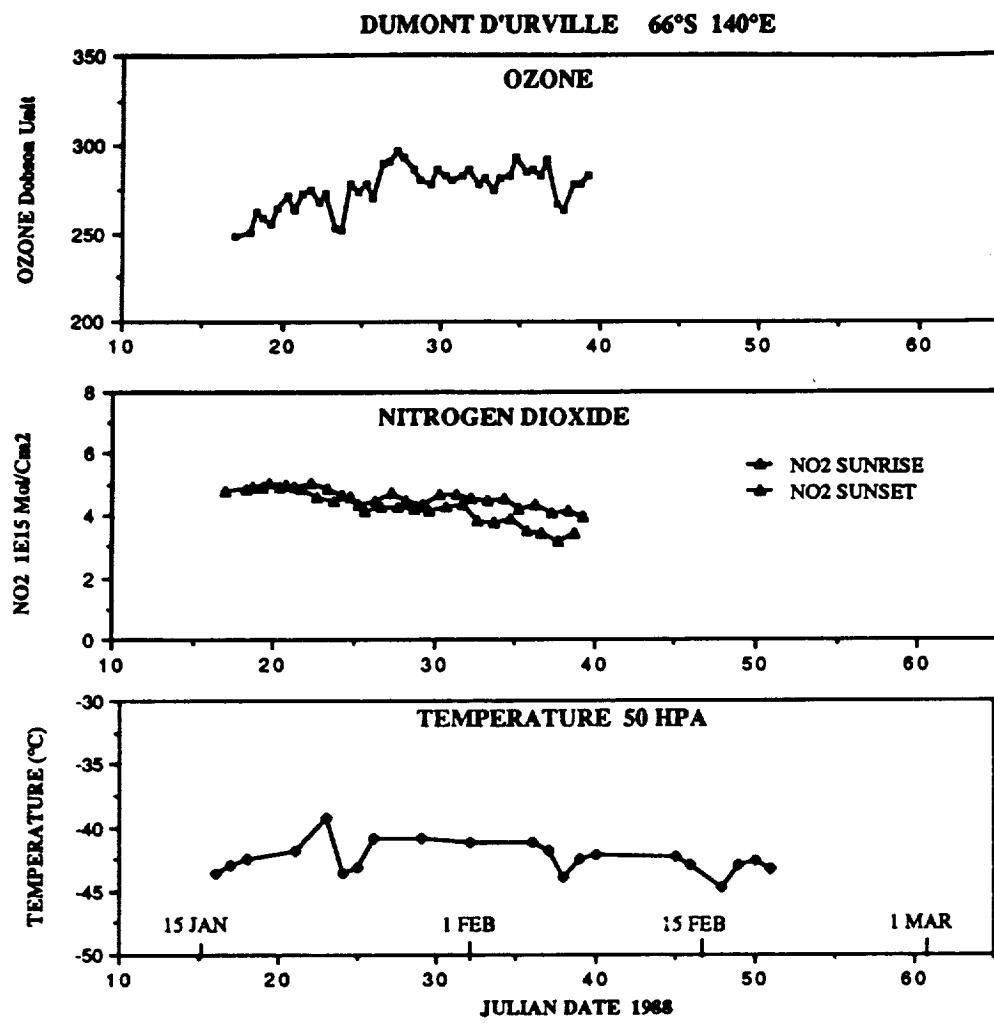


FIGURE 1

The Artic instrument began its measurements on January 16 and is still running as the exceptionnal stratospheric winter 1987-88 continues (figure 2). Ozone was observed to increase slowly in average from 300 DU to 390 DU until mid February afterwards large variations are present, the lowest columns being correlated with the polar vortex approaching Northern Scandinavia. Nitrogen dioxide is found to vary considerably at Kiruna. Although the station is located 2000 km north of the major industrial and urban European areas, large pollution episodes were found at several circonstances. They occur when the surface wind is directed from S-SE to SW. Observed columns, that is vertical columns if the species is tropospheric, reached values as high as $1.5 \cdot 10^{17}$ mol.cm⁻². Making the difference between polluted and clear periods is not always straight forward. If only those situations where the surface wind is outside the polluted sector are kept, then NO₂ appears to be strongly correlated with temperature at 30 mb.

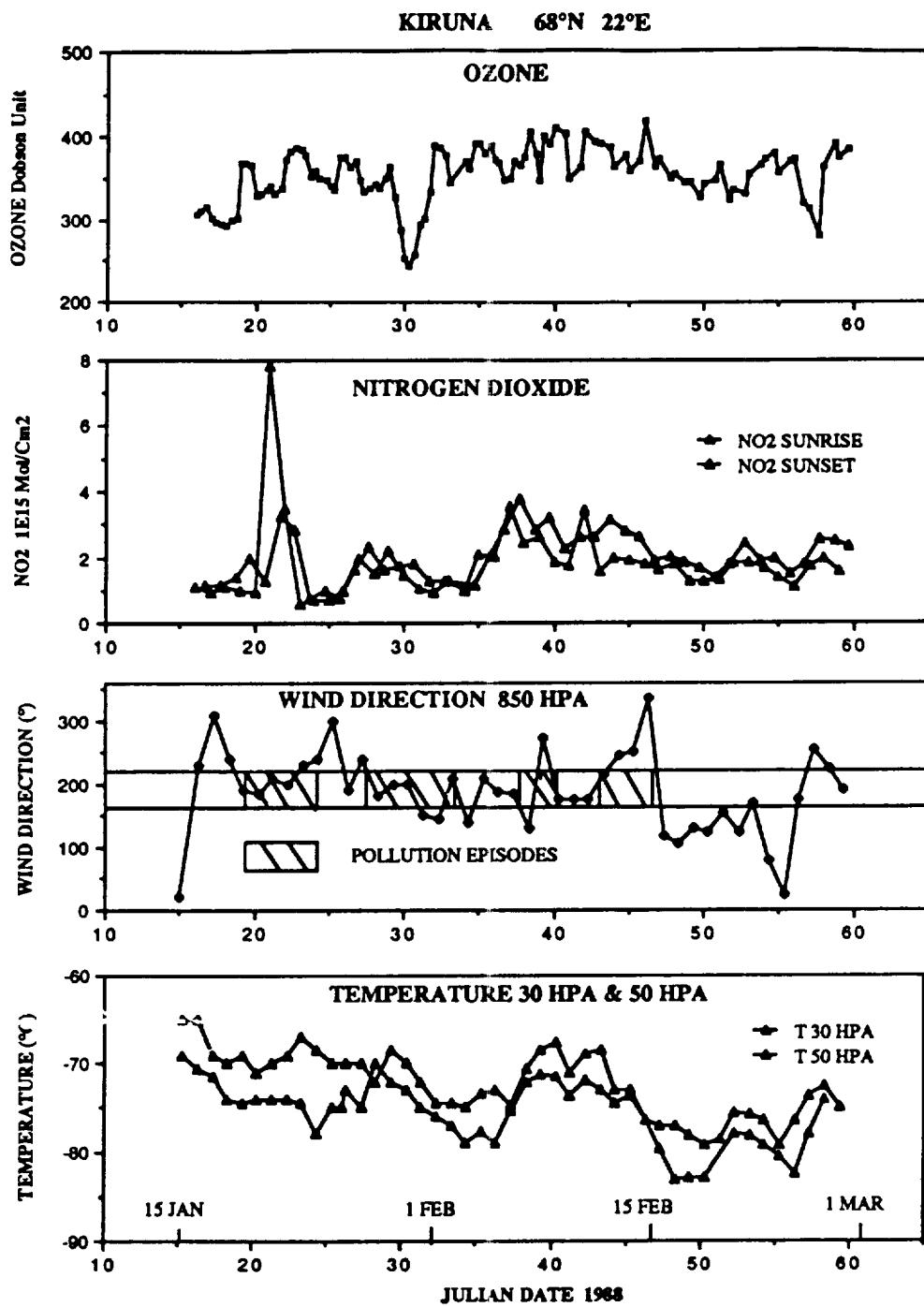


FIGURE 2

For the lowest temperature (-82°C), the column is reduced to values below $1.10^{15} \text{ mol.cm}^{-2}$. The diurnal cycle totally absent in January is still very small by the end of February although the sun culminates at 76° at noon. Its amplitude covaries with stratospheric temperature. Measurement will follow on, the data recorded will be reprocessed and we expect to present a complete picture of the evolution of both NO₂ and O₃ up to the final spring warming.